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ROUGH SKETCH OF A NEW THEORY OF CONTINENTS' FORMATION

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ROUGH SKETCH OF A NEW THEORY OF CONTINENTS' FORMATION

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SUMMARY

The essential characteristic of the distribution between the oceanic and continental domains (terms of 1st order of development into Prey's spherical functions) is compatible with an external origin of the differentiation: it would concern a total (antecambrian) glaciation occurring under astronomical conditions favoring a notable climatic asymmetry. The scheme envisaged is in agreement with my law of permanence of the eustatic level.

author

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Is the origin of continents internal or external? Most of hypotheses envisioned (contraction, convection currents, expansion) are in favor of an internal origin. However, I proposed an external origin, linked with important glaciations [1]; then, taking into account the erosion and the subcrustal sedimentation (P. Gidon), I modified my scheme [2]. After imparting to it a new transformation, I now am in a position to present a rough draft of a new theory.

The ideal would consist in giving account of the present distribution, but it presents such a disorder that it must be considered as the result of complex phenomena. It is thus appropriate to explain the essential in the first place.

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* Ebauche d'une théorie de la formation des continents.

In order to make a distinction between what is important and what is not, we have a secure method which consists in developing the reliefs, both continental and oceanic, in series of spherical functions. We then successively isolate the terms of 1st, 2nd .. etc. orders. This has been computed 40 years ago [3].

The essential character of the distribution corresponding to terms of first order (zonal and sectorial), consists in a dissymmetry, underlining an ocean zone greater than a hemisphere, and a continental zone, all of a piece. That is what would be appropriate to explain in the first place, and it seems to be quite difficult, apropos such dissymetry, to resort to an internal origin.

Per contra, the obliquity of the ecliptic and the eccentricity of the terrestrial orbit induce by their conjugate effects a North-South asymmetry: the winter of the Northern hemisphere is actually by eight days shorter than that of the Southern hemisphere. On the other hand, the periodical variations of the eccentricity are sufficient to uphold notably this asymmetry, even within the framework, however questionable for a long period, of the stability of the solar system. The Verrier tables concerning a 200 000 years' duration, centered upon the date 1800.0, include extreme values of 0.078 and 0.003 (the current value is 0.017). The difference between the Southern and Northern winters would have attained nearly one month [4].

The terrestrial orbit's eccentricity was invoked apropos the genesis of the Antarctica [5], which does not begin to appear until the 4th order of spherical functions' expansion : the continents would have formed by solidification toward 1000° of a silicate bath, and a first bombardment indiced by the climatic asymmetry, would have marked the rough-shaping of the Antarctica.

How much more important could this influence have been at time of glaciations! The most ancient of those, of which the remains were recognized, would have been only of 800 million years; however, it may be presumed that glaciations have occurred in the most remote precambrian, but their traces have been destroyed by metamorphism and erosion.

My viewpoint (external origin of the differentiation) is compatible with the essential character of the present distribution on the condition of admitting that the globe's superficial layers have undergone displacements relative to the axis of rotation. It is well known that numerous observations, namely in the fields of geology, paleoclimatology and paleomagnetism, are in favor of such displacements; however, this is still not clear and we shall dwell upon this later.

The asymmetry is not only dependent on eccentricity, but also on the respective positions of the perihelion and of solstices, and also on the precession of equinoxes. Various factors add up to those of astronomical order (absorption and circulation of the atmosphere, oceanic currents, etc.). A complete analysis of the problem seems difficult, but it should be sufficient to retain the possibility for one of the polar regions to have during a few thousand years a mean temperature distinctly inferior to that of its antipode.

Imagine that during the remote antecambrian the Earth was in its "natural" state, allowing only for the zero order spherical function (in regard to hypsometry, not to potential); this would be the "panthalassa" a uniform universal ocean. Assume then the onset of a glacial period with accentuated asymmetry with polar region's ice-floe taking in its coldest part enormous dimensions : its thickness would notably surpass that of the present-day Greenland and Antarctica (the known record is above 4000 m). Hitting the bottom of the Ocean 2500 m deep with the current mass of H_2O, the ice-floe evolves into an "inlandsis". As the latter grows, the isostatic readjustment develops a compensating root owing to erosion and subcrustal sedimentation [2]. The heating, succeeding to the cold period, results in inlandsis' fusion; this transfer of H_2O from glacial to oceanic domain can take place more rapidly than the inverse process (requiring atmospheric transfers), so that the subcrustal erosion and sedimentation take speed: the fusion's isostatic readjustment is thus essentially constituted by an ascending motion of the root, which thus becomes the primitive continent.

Is it possible to evaluate the importance of the glaciation involved in the process ? The answer is not only affirmative, but its simplicity seems to validate the preceding rough-shaping. I have indeed

stated the following law : in conformity with the isostasy the so-called eustatic level of oceans and, which amount to the same, the mean altitude of continents are independent from the volume of the inlandsis [6]; that is, if water of the present-day oceans were totally transformed into continental ice, the mean altitude of the continents, which is quasizero on condition of not omitting the continental plateaus, would remain quasizero taking into account the isostatic readjustments; the surface of the continents would be at the same mean level as the oceanic bottoms; we thus are faced again with what I consider as the state of the terrestrial crust at the end of the glaciation envisioned, which would have been total. It seems difficult to consider such an agreement between a law concerning eustatism and a scheme of continent formation as fortuitious.

As to the other terms of development (expansion) in spherical functions, we should know the displacements of the superficial layers of the globe if we were to account for them. But the observations do not allow the splitting of the various theories concerning partial movements (continents' translations) or global ones (translation of the terrestrial crust as a whole). The recent progress in paleomagnetic studies seems favorable to partial movements. It is not excluded to envision, besides the subsequent less important and more or less asymmetrical glaciations, the intervention of other phenomena, for example, convection currents, that may perhaps be related to actions of external origin: I had signaled [7], that certain undulations of the geoide could have had an external origin (meteorites). V. S. Safronov [8] expressed an analogous viewpoint and attributed to certain incriminated meteorites a mass equal to one millionth of that of the Earth.

Remark.- The subcrustal erosion and sedimentation system, utilized in my rough scheme, account well for the surprising altitude of the Antarctica [9].

**** THE END ****

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